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Reply to: 3420

Date: February 24, 1995

Subject: Diagnosis of Alder decline along the Hassayampa River, Bradshaw
Ranger District, Prescott National Forest

To: Forest Supervisor, Prescott National Forest

On August 26, at the request of Ron Stein, Soils Scientist, Prescott National Forest, Jill Wilson, Entomologist, and I examined alders growing along the Hassayampa River. Ron was concerned about the decline of Alnus oblongofolia, located along a section of the River. This letter reports on our findings.

We examined alders at three locations along the river (Figure 1). At two of the three sites (sites 1 and 2 in Figure 1) we observed many alders with multiple injuries, including heavy defoliation caused by the alder flea beetle, Altica ambiens Le Conte, bole wounds caused by flood damage and often associated with the bole wounds, canker diseases caused by Hypoxyylon spp. and Cytospora spp. At both of the first two sites Ron also noted evidence of high peak flows as well as the sparseness of perennial herbaceous plant populations along stream banks. At the third site located upstream from the first two, defoliation caused by the flea beetle was very light, and flood damage and associated cankers were not found. Ron commented on the abundant growth of sedges along stream banks which was serving to stabilize stream channels.

The alder flea beetle is a native insect, in the family Chrysomelidae, which occurs throughout the western United States. These insects are referred to as flea beetles because the adults are powerful jumpers. Alder is the principal host. Both adults and larvae feed on alder foliage, adults chew holes in leaves while larvae are skeletonizers. One generation is produced per year. The shiny dark blue adults, which are about 5-6 mm long hibernate during the winter in debris beneath trees and in other sheltered places. They reappear early in spring to resume feeding. Clusters of yellow eggs are deposited not long after adult appearance. Larvae reach maturity in August and pupate on the ground in the duff. Mature larvae are about 8 mm long and are brown to black above and yellowish below with a shining black head and thorax and short legs. Adults emerge within a week to 10 days and are voracious feeders until the close of the season.

This insect usually occurs at low population levels but occasionally outbreaks occur. We are not aware of any published information concerning effects of outbreaks on alder or on conditions conducive to outbreak development. We can provide some general information on these topics however. Defoliation affects trees by disrupting the production, utilization and transfer of substances required for growth, regulation of growth, and survival. Effects may be both short and long term and include reduced growth (diameter, height, or shoot), bud survival, leaf size and number, seed production, vigor (susceptibility to secondary attack by other insects and pathogens) and overall survival. In general hardwoods have greater carbohydrate reserves, and are better able to withstand defoliation than conifers. Many deciduous trees may survive several years of defoliation with minimal changes in growth. It should be noted, though

that at the first two sites we looked at, the alders looked very stressed, even without the defoliation, so effects of defoliation could be more severe in these areas.

It is generally believed that insect herbivores respond positively to various forms of plant stress such as drought, air pollution or environmental injury. With some herbivores, such as the bark beetles, the evidence for this is quite strong; however for defoliating insects such as the alder flea beetle, the ecological and physiological relationships are less well understood. Further, attempts to reproduce such effects experimentally have not always been successful. The latter may not mean that stress is not important, only that we are not able to fully reproduce the effects of stress experimentally.

Both Hypoxylon and Cytospora are opportunistic fungi that invade bark on twigs, branches, or main stems of trees that have been weakened by drought, freezing, heat, poor nutrition, mechanical injuries, insects, or other diseases. New cankers appear as yellow, orange, or brown lesions in the bark which may enlarge to eventually girdle branches or stems. Fruiting structures of Hypoxylon form on dead portions of the canker in cracked bark. These cushionlike structures, called stromata, are whitish to gray when young and hard and black when mature. Each stroma contains up to 30 chambers (perithecia) with pores where spores emerge. The spores are discharged to the air following rains and can infect wounds that penetrate to the wood. The fruiting structures of Cytospora appear as raised pimples on the bark that exude masses of sticky spores in orange ribbons or tendrils. The spores also infect wounds. All of the infected trees exhibited wounds that appeared to be caused by flood debris. These wounds, along with additional stress related to flooding and siltation, probably led to the proliferation of the canker diseases.

At the end of our visit we indicated that we would be interested in working with Ron and other interested individuals in setting up a monitoring system to follow this situation. Little is known about insects and pathogens affecting alder, particularly our native alders here in the southwest so anything we learn from this effort will add to our knowledge of these species. If you have any questions concerning this letter please contact Jill Wilson (556-2074) or myself (556-2073).

/s/ Borys M. Tkacz

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